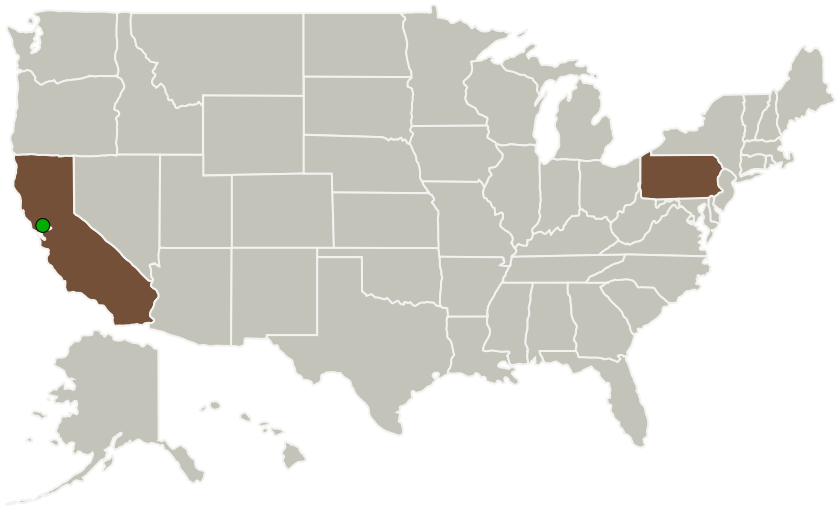
Autonomous, Safe Take-Off and Landing Operations for Unmanned Aerial Vehicles in the National Airspace, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

Unmanned aerial systems (UAS's) and in particular intelligent, autonomous rotorcraft and fixed-wing aircraft have the potential to significantly impact modern society. A few examples of their utility include aerial surveying in difficult-to-access terrain, precision agriculture, package delivery, moviemaking, infrastructure inspection, fire fighting, search and rescue, etc. Recently there has been a lot of interest in autonomous air vehicles for cargo delivery to improve cost and time associated with shipping goods. Finally, much of the technology for autonomy could be used as a pilot's aid to help in difficult tasks such as landing a helicopter on an oil rig in the high seas or in the personal air vehicles of the future which are envisioned to be operated by people without significant pilot training. While the technology for unmanned air vehicles operating day in and day out without constant human supervision is maturing steadily, much remains to be done to make these vehicles commonplace. We have identified a number of challenges that must be addressed for these vehicles to safely and efficiently conduct their tasks in the National Airspace System (NAS). Civilian applications of UASs must ensure that they can: 1. sense and avoid other vehicles and follow air traffic commands, 2. avoid the terrain and land without operator intervention, 3. react to contingencies such as engine out and lost link scenarios, and 4. be reliable and cost-effective. We propose to a combination of software algorithms and low-cost, low SWAP sensors that simultaneously solves the navigation and obstacle detection problem, especially as relates to operation in cluttered environments. That is, in this program we will show that it is possible for small autonomous air vehicles to reliably and safely fly in the first and last 50 feet of operation.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Near Earth Autonomy, Inc.	Lead Organization	Industry	Pittsburgh, Pennsylvania
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Pennsylvania

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Summary: Autonomous, Safe Take-Off and Landing Operations for U nmanned Aerial Vehicles in the National Airspace, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138722)*

Images

Briefing Chart Image
Autonomous, Safe Take-Off and Landing Operations for Unmanned Aerial Vehicles in the National Airspace, Phase I *(https://techport.nasa.gov/image/126448)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Near Earth Autonomy, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Sanjiv Singh

Co-Investigator:
Sanjiv Singh

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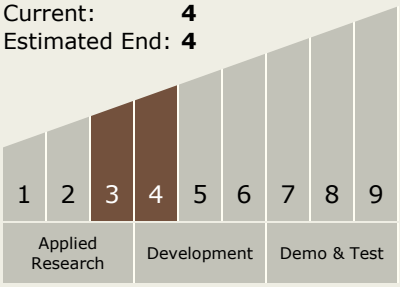
Completed Technology Project (2015 - 2015)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.4 Aeroacoustics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System